Research & Development at the USEPA:
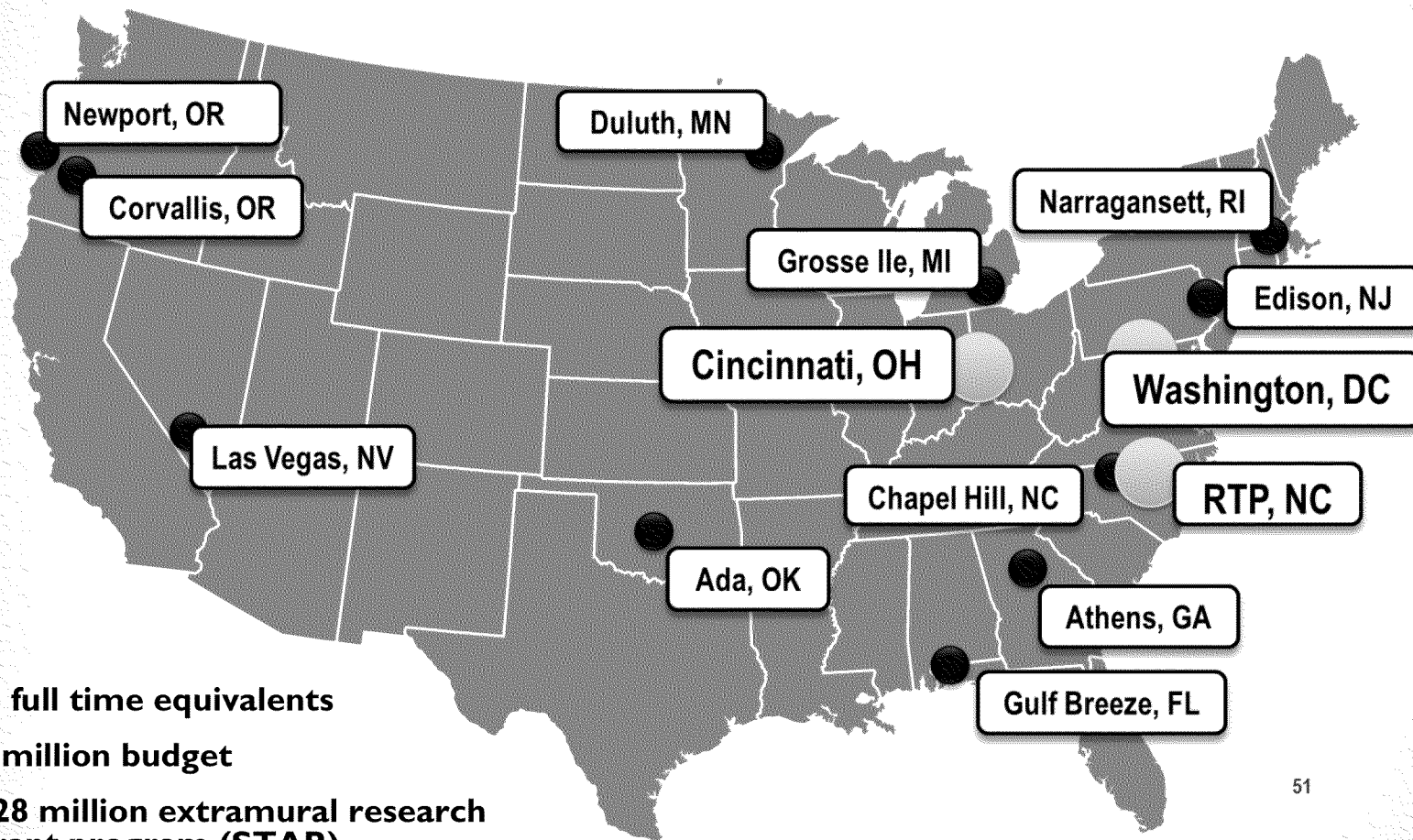## Focus on Robust Science
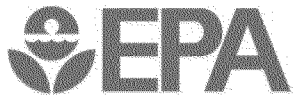
1. **ORD at a Glance**

2. **Aligning with EPA draft Strategic Goals**

3. **ORD Research**

   a) **Long-term Research**

   b) **Research on Specific Environmental Challenges**

   c) **Technical and Emergency Support**

4. **EPA Research in Action**

5. **Resources**

6. **Critical Issues**

7. **Outlook and Conclusions**

8. **Appendix**

ORD at a Glance

Newport, OR

Duluth, MN

Corvallis, OR

Narragansett, RI

Grosse Ile, MI

Edison, NJ

Cincinnati, OH

Washington, DC

Las Vegas, NV

Chapel Hill, NC

RTP, NC

Ada, OK

Athens, GA

Gulf Breeze, FL

51

- **1,704 full time equivalents**
- **$498 million budget**
  - **$28 million extramural research grant program (STAR)**
- **13 research facilities**

(FY 2017 Enacted Budget)

Goal 1 : Core Mission

Goal 3: Rule of Law

- Goal 1: Deliver real results to provide Americans with clean air, land and water.
- Goal 3: Administer the law, as Congress intended, to refocus the Agency on its statutory obligations under the law.

Objective 1.3 & 3.2:

Revitalize Land & Prevent Contamination

Prioritize Robust Science

- Refocus EPA's robust research and scientific analysis to inform policy making.

ORD National Programs

- Air & Energy (A&E)
- Safe & Sustainable Water Resources (SSWR)
- Chemical Safety for Sustainability (CSS)
- Human Health Risk Assessment (HHRA)
- Sustainable & Healthy Communities (SHC)
- Homeland Security Research Program (HSRP)
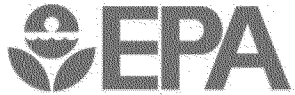
ORD provides the scientific foundation for EPA to execute its mandate to protect human health and the environment.

1. <u>Longer Term Research</u>: ORD conducts innovative and anticipatory research applied to a range of EPA program and regional needs in air, water, land, and homeland security to solve longer term major environmental challenges and provide the basis of future environmental protection.

2. <u>Research on Specific Environmental Challenges</u>: ORD experts provide research support to EPA program and regional offices, as well as states, tribes, and communities, to help them respond to contemporary environmental challenges.

3. <u>Technical and Emergency Support</u>: Because of our expertise, local, state, and national officials come to us for technical support to respond to environmental crises and needs, large and small.

EPA's Computational Toxicology research applies cutting-edge technologies to efficiently and economically evaluate the safety of thousands of chemicals currently in use.

Application of CompTox research include:

• Use of CompTox data for prioritizing chemicals in EDSP and replacing time and resource intensive Tier 1 assays

• Deploying CompTox Chemistry Dashboard Behind OPPT CBI Firewall

• RapidTox

    • TSCA Pre-prioritization Workflow and Underlying Data

    • Prioritization Workflow for OPP PesticideInerts

    • Dashboard for OLEM/Superfund Screening Level Asssessments

• TSCA Alternatives Strategic Plan

• International use of CompTox data for prioritization (e.g., Canada) and chemical evaluation (e.g., Europe)
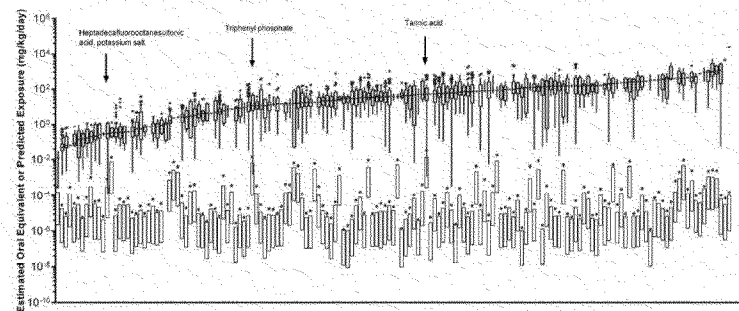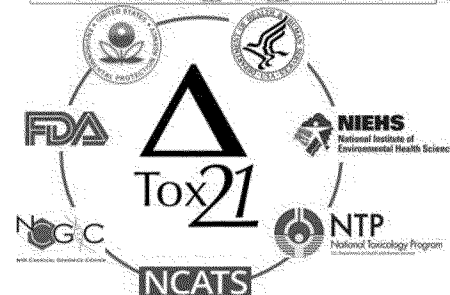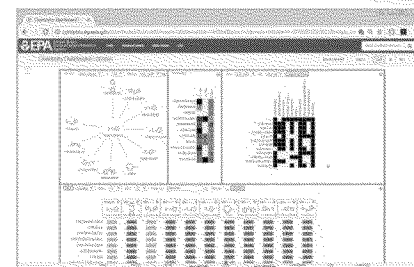
**ORD's Homeland Security Research
Program** focuses on protecting water systems'
security, and remediating wide-area contamination
incidents.

Advances in decontamination research include:

- Identification and testing of several anthrax
  decontamination technologies in partnership with the
  Department of Homeland Security.

- Evaluation of decontamination techniques in real-
  world situations to measure the costs and
  effectiveness of each method, and the expense of
  managing waste from cleanup.

- Developing water infrastructure cleanup methods at
  EPA's Water Security Test Bed thereby giving utilities
  proven approaches to help to return their
  contaminated systems to service quickly and
  effectively.
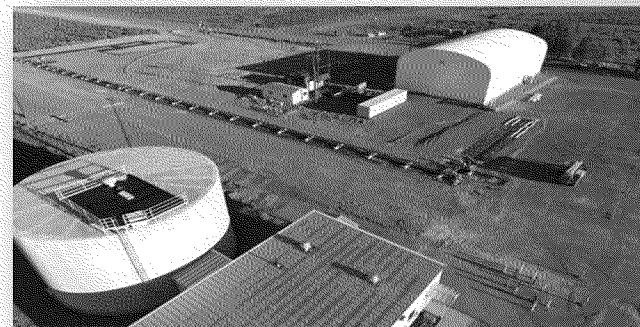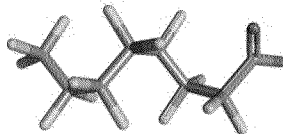
ORD Researchers supporting key priorities:

1. **Hazard information**
Studying the potential hazards of PFAS in the environment using cutting-edge technologies pioneered by our computational toxicology research

2. **Validating methodologies for measuring PFAS in environmental media**
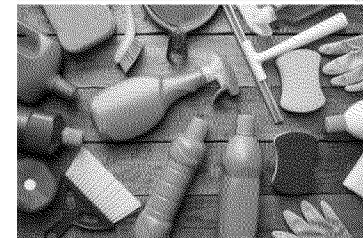Developing robust analytical methods for ground, surface, and wastewater and for solids including soils, sediments, and biosolids

3. **Reducing exposure**
Assisting states and federal partners in the remediation of environmental media, including drinking water

4. **Risk communication**
Working with ECOS and ASTHO to put together a risk communication plan that can be used nationwide

TSCA Implementation

– Providing research expertise to evaluate specific chemicals and framing broader assessment activities within timelines mandated by the new law

– Systematic Review

– Regulatory Support

– Chemical Prioritization

– Risk Evaluation

– Ambient Exposure Estimation

– Alternative to Vertebrate Testing Strategy

Supporting States & Regions:

– Researching methods to improve the ability to identify
lead service lines (LSL) in a non-destructive way (e.g.,
Flint, MI; Galesburg, IL)
– Assessing composition of scales and treatment progress
(e.g., Fall River, MA; Providence, RI; Flint, MI)
– Assist with review of corrosion control plans and studies
(e.g., Sebring, OH; Denver, CO; Providence, RI)
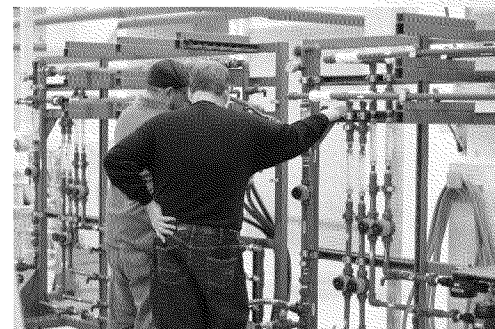
Supporting the Lead & Copper Rule:

– Option Selection
– Multimedia exposure modeling to inform a health-based
benchmark (HBB) for lead in drinking water
– Corrosion control treatment options for various water
systems
– Sampling methods for monitoring Pb
– Cost and benefits analysis
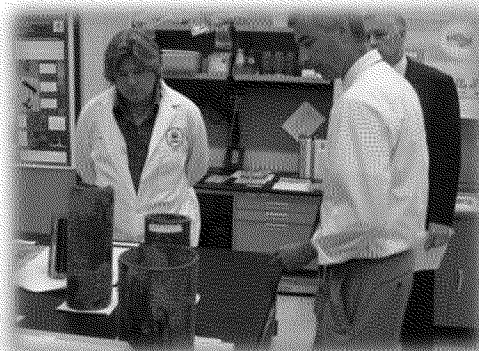
"During the 2001 and 2006 anthrax incidents in New York City and the 2014 Ebola crisis, New York State reached out to EPA ORD… collaborative efforts by EPA and the NYSDEC have contributed significantly in the management of biohazardous waste that has been both timely and crucial to protecting public health."– **Alan Woodard, PhD, Research Scientist, NY State Dept. of Env. Conservation**
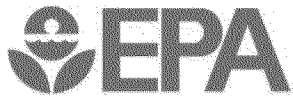

"When we were faced with an emergency in Toledo last August due to cyanobacteria toxins detected in their treated drinking water, EPA ORD staff was a great partner and exceeded our expectations in understanding science and helping optimize treatment and restore safe drinking water to our residents."– **Ohio EPA Director Craig Butler**

"The information ORD provided helped the Louisiana Department of Environmental Quality (LDEQ) design and implement actions to reduce chloroprene emissions from the plant. The multistep Denka remedy is in the first stages of its implementation and has already produced significant reductions in chloroprene emissions. When agencies work together, everyone benefits,"—**Dr. Chuck Carr Brown, LDEQ Secretary.**

Additional examples of ORD supporting states can be found here: https://www.epa.gov/research/us-epa-office-research-and-development-and-environmental-council-states-partners-meeting

EPA

ORD's Regional Science Program

- Regional Applied Research Effort – responds to high priority, near-term applied research needs of EPA's regions, state and local governments, and tribes
- Regional-ORD Community of Science Networking Program – A networking program for regional scientists and engineers who have limited familiarity with ORD

ORD's State Outreach Program

- Responds to States' request for technical support
- Works closely with ECOS and the Association of State and Territorial Health Officials (ASTHO) through a Memorandum of Agreement.
- Reviews the ERIS Survey to better understand state research needs
- Shares information on ORD research products and tools via webinars
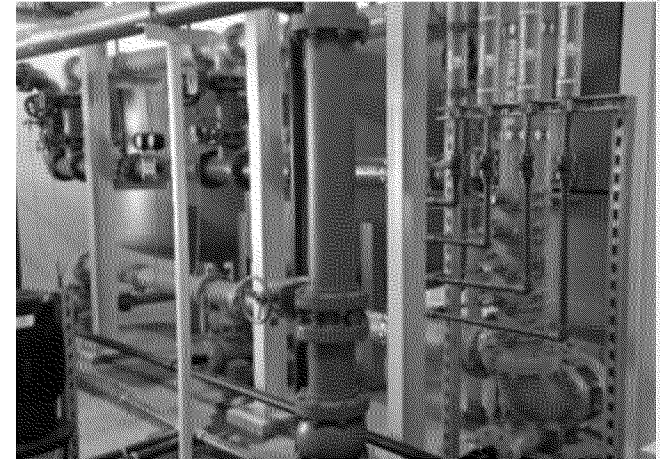
"Ammonia residual in the distribution system can cause nitrification and other operational 'nightmares.' This EPA ORD supported pilot project in Palo is successful and the use of biologically active filters is an innovative, emerging drinking water technology that can be a viable option for certain other systems."
— Bill Ehm, Director, Environmental Services Division, Iowa Dept of Natural Resources

(10)

AK – PFAS
ID – Modeling for agriculture, energy, water and air systems interactions
OR – Water nitrate contamination; Tools to help communities identify environmental issues; Ocean acidification research; Reducing methyl mercury levels; Advanced monitoring technologies
WA – Managing nutrients in riparian ecosystems; Habitat suitability models

(9)

CA – Evaluating chemicals; Population and land use projections; Synthetic turf field safety; Decontaminating subway railcars; Decision support tools to advance communities' priority projects; Risk assessment training; Advanced monitoring technologies
NV – Groundwater characterization and remediation

(8)

CO – Simulating conditions in drinking water utilities; Advanced monitoring technologies
MT – IRIS assessment for Libby Amphibole Asbestos; Asbestos exposure following forest fires
UT – Fine particle air pollution; Emissions measurement methods

(7)

IA – High ammonia levels in drinking water
KS – Prairie rangeland burning; Community air quality monitoring
MO – Models and tools to reduce sewer overflows
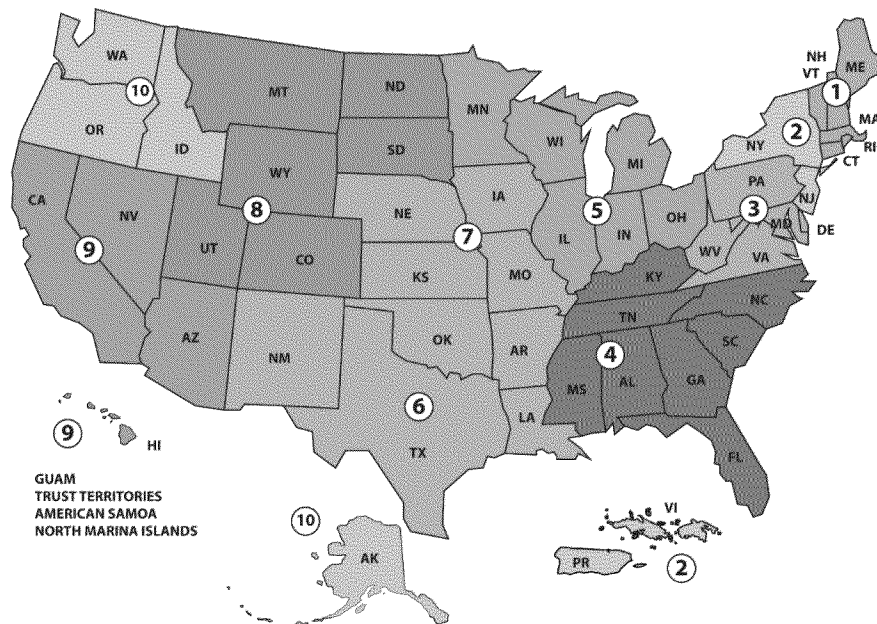
(6)

LA – Cancer risk assessments
OK and TX – Community air quality monitoring
OK – Chemical composition analysis; Evaluating water interactions at Superfund site
TX – Chemical contamination risks

(5)

MI – Lead contamination technical support; Simulating conditions in drinking water utilities
MN – Sulfate standard development support; Modeling bioaccumulation of PCBs and mercury in fish
OH – Harmful algal blooms limiting drinking water; Managing algal toxins; Small drinking water systems; Simulating conditions in drinking water utilities
WI – Predicting water quality at beaches

(1)

CT – Community air quality monitoring;
CT, MA, ME , NH, RI and VT – Stream monitoring network; Planning for energy and air emissions
CT and NH – Advanced monitoring technologies
ME – Tribal risk assessment (sediment and water quality)
VT – Impervious cover data for watersheds

(2)

NJ and NY – Stream monitoring network; Planning for energy and air emissions
NJ – PFAS
NY – Management of bio-hazardous wastes; Planning for biological incident; Simulating conditions in drinking water utilities
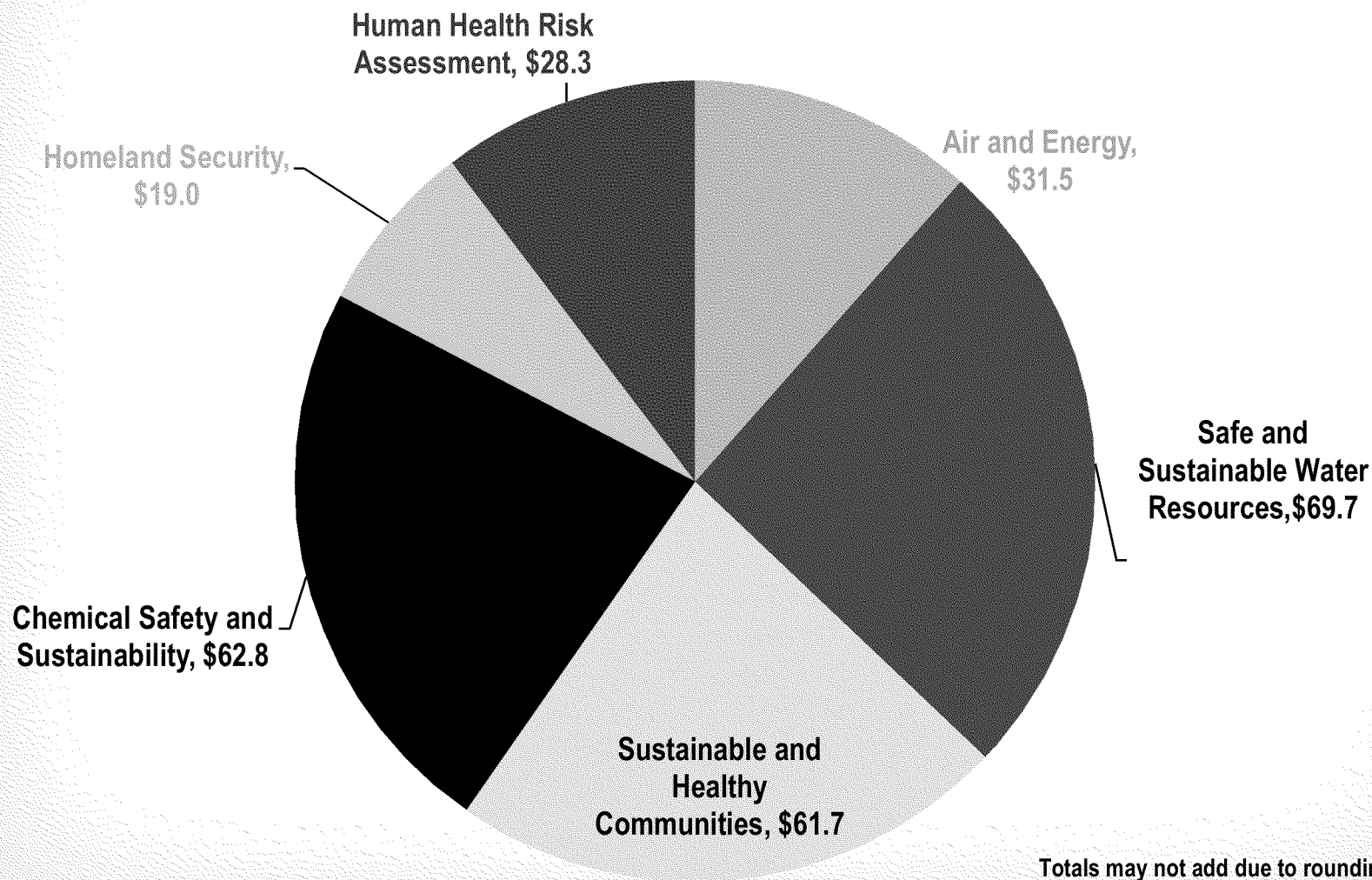
(3)

DE, MD, PA, VA and WV – Stream monitoring network
MD – Managing stormwater treatment systems; Advanced monitoring technologies; Reducing harmful air pollutants; Management of bio-hazardous wastes
MD, PA and VA – Stormwater management planning support
PA – CADDIS causal assessment; Community air quality monitoring

(4)

AL, GA, KY, NC, SC, TN – Stream monitoring network
FL, GA, KY, NC, SC, TN – Characterizing urban background levels for contaminated site cleanup levels
FL, KY – Simulating conditions in drinking water utilities
GA – Green infrastructure in Atlanta's Proctor Creek
KY – Advanced monitoring technologies
MS – Fecal bacterial and viral indicators
NC – Community air quality monitoring; STEM education; Wright Chemical Superfund Site
SC – Food waste reduction

ORD's FY 2019 Budget by Research Program Projects

- Human Health Risk Assessment, $28.3
- Air and Energy, $31.5
- Homeland Security, $19.0
- Safe and Sustainable Water Resources, $69.7
- Chemical Safety and Sustainability, $62.8
- Sustainable and Healthy Communities, $61.7

Totals may not add due to rounding

ORD FY 2019 OMB Submission

Program/ Project	FY 2017 Enacted	FY 2018 PB	FY 2019 OMB	Net Change from FY 2018 PB
	$M	$M	$M	$M
ACE	$91.9	$30.6	$31.5	$0.9
SSWR	$106.2	$68.6	$69.7	$1.1
SHC	$146.2	$60.2	$61.7	$1.6
CSS	$89.1	$61.7	$62.8	$1.0
HHRA	$40.6	$27.8	$28.3	$0.5
HS	$20.2	$18.7	$18.9	$0.2
National Priorities	$4.1	$0.0	$0.0	$0.0
Workforce Reshaping	$0.0	$9.3	$0.0	-$9.3
TOTAL	**$498.4**	**$276.9**	**$272.9**	-$4.0

Totals may not add due to rounding

&EPA
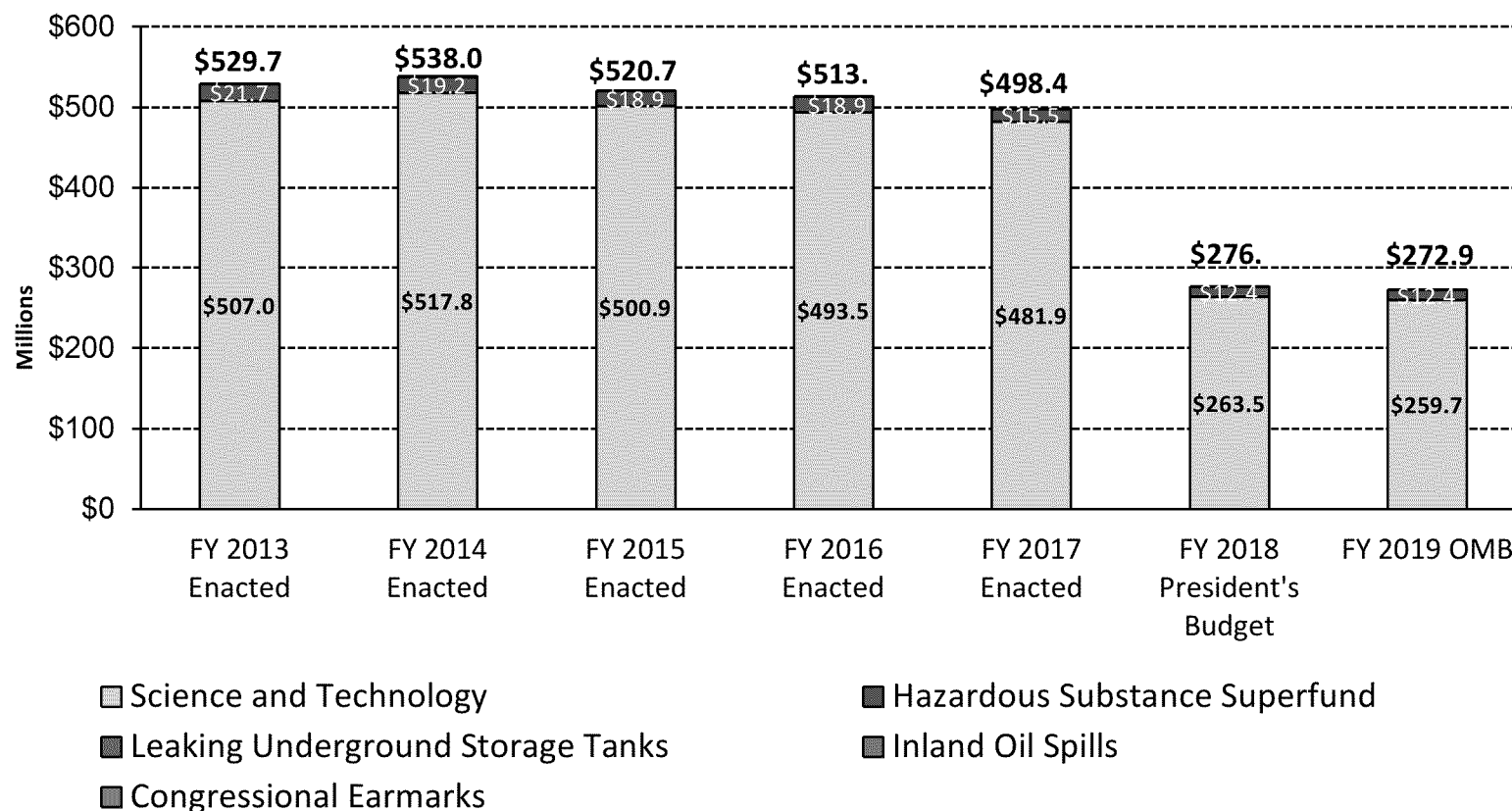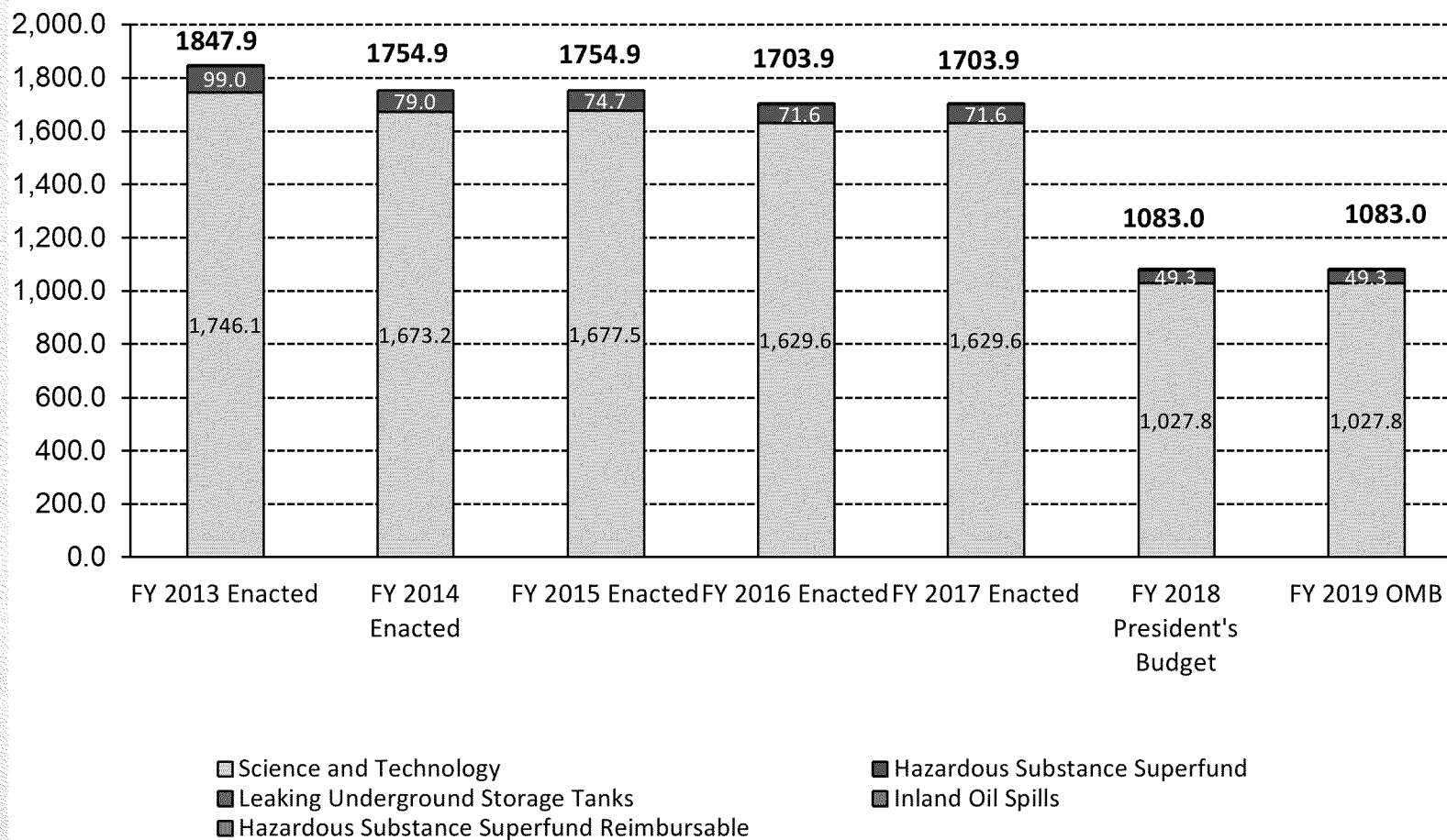
ORD receives 58% of the Agency's S&T appropriation, making up 97% of ORD 's total budget

2019 OMB EPA S&T:
$447.6M

2019 OMB ORD:
$272.9M

OARM
$68.8M

OAR $95.6M

ORD 58%

Superfund

$263.5M

S&T 97%
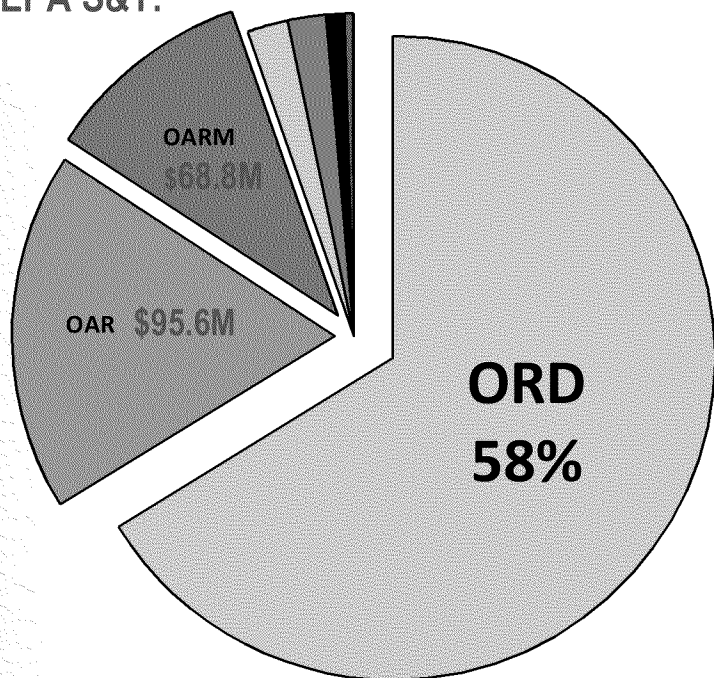
S&T Appropriation by EPA Office
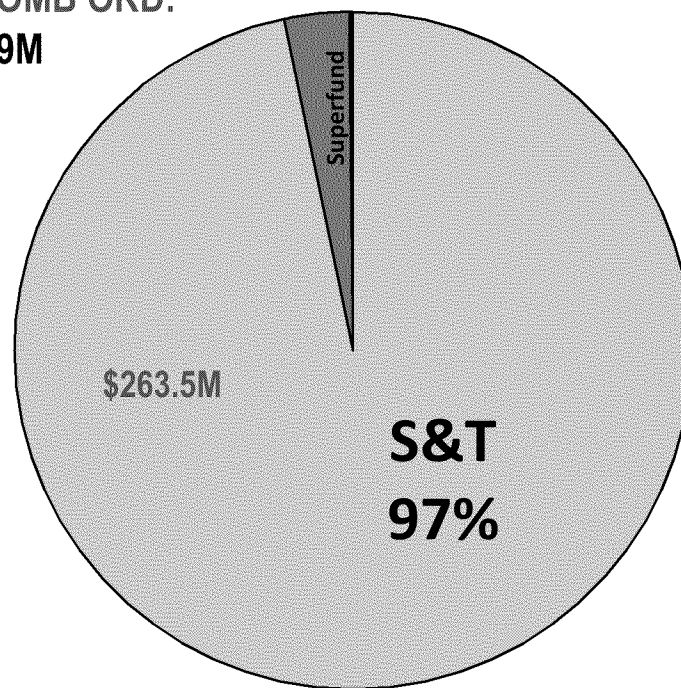
ORD by Appropriation

Note 1: Includes OCFO ($.5M), OEI ($2.6M), OCSPP ($5.1M), OW ($4.6M) and OECA ($10.6M)   *Note 2: Includes Superfund ($12.4M) LUST ($0.3M) and Oils Spills ($0.5M)*

ORD Total Budget with Inflation Indices
(enacted budget, includes earmarks, dollars in millions)

Nominal line: $552.9, $581.7, $567.5, $529.7, $538.0, $520.7, $513.3, $498.4, $276.8, $272.9

CPI line: $552.9, $430.8, $411.8, $378.8, $378.6, $363.5, $360.8, $342.2, $187.3, $187.3

Years: 1999, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018 PB, 2019 OMB

Source: Bureau of Labor Statistics: CPI Inflation Calculator

Legend: Nominal, CPI
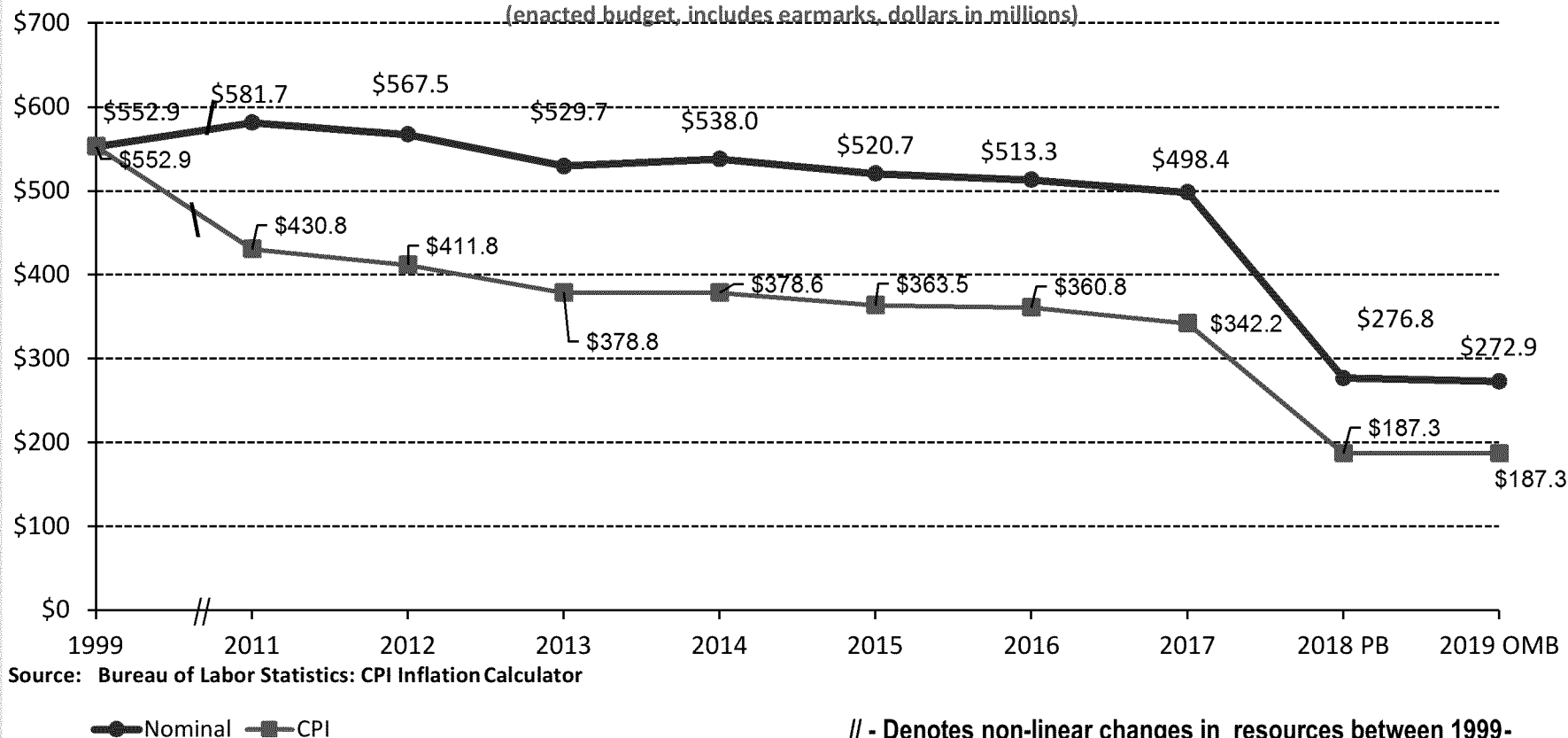
// - Denotes non-linear changes in resources between 1999-2011.

Four Year Strategic Planning

- By 2022, increase the percent of decisions using EPA research and scientific analysis by specific level which will be finalized in December

Annual GPRA Reporting

- Percent of High Priority Products delivered on time
- Percent of Outputs delivered on time
- Annual IRIS, PPRTV, ISA progress scores
- Percent of decisions using ORD research and scientific analysis
- Number of peer-reviewed journal articles with datasets cleared for publication

Quarterly Reporting

- Percentage of High Priority Products on track or on time for delivery
- Number of peer-reviewed journal articles with datasets cleared for publication
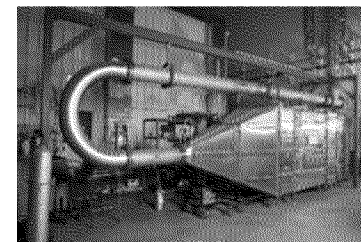
- Aging Workforce

- Title 42 Extension

- Facilities

- Integrated Risk Information System (IRIS)
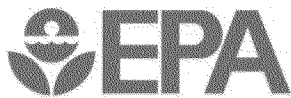
- Science to Achieve Results (STAR)

"[T]he Title 42 authority has enabled EPA to attract strong candidates for science-leadership positions, strengthen existing research, develop an important and impressive research program…"

The National Academy of Sciences 2010 report

- Provides EPA with an important tool to make critical workforce investments needed to accomplish its mission.

- Allows EPA to compete for the best and the brightest environmental researchers in academia, private industry, and other government agencies by offering competitive, market-based salaries.

- Recently extended to include mid-career hiring.

- Gives EPA flexibility in hiring for short-term (~5 yrs) needs.

Laboratory Consolidations that yield savings for both EPA and ORD

– Athens, GA

- ORD and Region 4 will be consolidating operations in Federally owned space.
- ORD's physical footprint will be reduced significantly
- Agency savings will result from R4 no longer needing to lease space, but there are decommissioning/EDDP costs incurred by ORD

– Las Vegas, NV

- Significant laboratory decommissioning underway addressing legacy use of this facility
- ORD laboratory personnel will be relocated to RTP in FY18
- Agency savings will result from ORD no longer needing to lease space, but significant costs will be sustained by ORD in order to clean up this facility

– Consolidation of Willamette and Corvallis, OR ORD locations

– ORD has vacated the Grosse Ile, MI location. Decommissioning of space ongoing

New IRIS Leadership

- The new NCEA Director brings knowledge of TSCA, innovative applications of computational toxicology, and exposure science, while the new IRIS Program Director is a recognized leader in systematic review and brings experience in early partner/stakeholder engagement/input, and demonstrated actions to increase capacity and transparency in assessments.

Modularize product lines

- Implement a portfolio of chemical evaluation products that optimize the application of the best available science and technology for a diversity of clients beyond EPA, including states, tribal nations, and other federal agencies.

Increase transparency

- Develop assessment plans that define user needs, frame the scientific questions, and outline the evidence that will be collected prior to draft development; seeking public input at this stage promotes transparency and ensures interested stakeholders are fully aware of IRIS Program activity.

Improve timeliness and responsiveness

- Deploy program and project management tools to more effectively and efficiently utilize human resources to ensure timely delivery of products.

Alaska

Hawaii

0
1-5
6-10
11-15
16-20
20+

324 STAR grants, centers and Fellowships in total

Puerto Rico
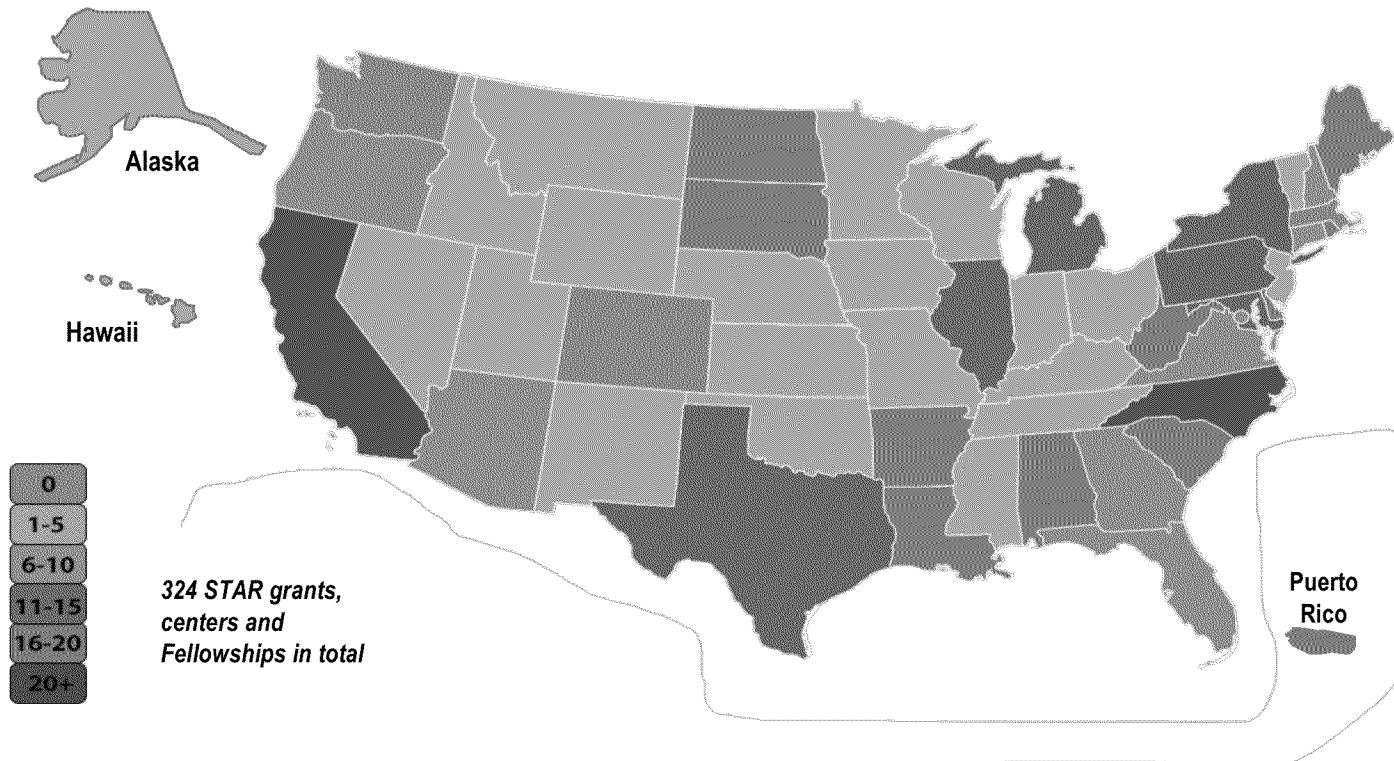
Science to Achieve Results (STAR)

- EPA's STAR program funds research grants through a competitive selection process.

- STAR engages some of the nation's best scientists and engineers in research that complements EPA's own research.

- The map shows extramural research grants, centers, and Fellowships active as of April 2017.

24

A commitment to consistent, predictable funding for research is critical to achieving results over time:

- *Longer-Term research:* foundational research necessary to inform and support regulatory decision-making

- *Research on Specific Environmental Challenges:* address emerging environmental issues to better protect public health

- *Technical and Emergency Support:* using our scientific expertise to address needs of states and regions
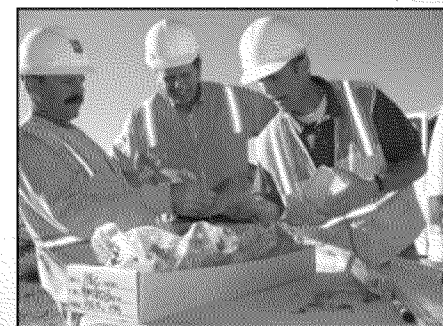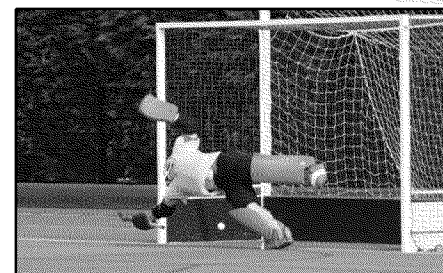
Appendix

- The **Air & Energy** research program focuses on the Administrator's priorities of
  - ☐ Providing timely, high quality, and relevant scientific information to meet the needs of partner Programs and Regional offices;
  - ☐ Design effective air quality management strategies;
  - ☐ Provide state-of-the-art tools that states use to identify effective emission reduction strategies.

- Accomplishments & Projected Activities
  - ☐ Improved affected communities' understanding of wildland fire emissions and improved air quality modeling of fires.
    - Initiated a Wildland Fires Sensors Challenge to encourage the development of low-cost, easy to deploy air pollution sensors.
    - Developed the Smoke Sense application to provide information directly to the public on air quality and strategies to protect their health from smoke exposure.
    - Updated the Community Multiscale Air Quality Modeling System (CMAQ) to estimate air quality impacts from wildland fires.
  - ☐ Will conduct research to provide information to the public on how to reduce health impacts from wildland fires.

⊕EPA

- The **Sustainable & Healthy Communities (SHC)** research program focuses on the Administrator's priorities of
  - ☐ Remediating and revitalizing contaminated sites;
  - ☐ Understanding the relationship between environmental quality and public health, especially in vulnerable groups (children and EJ communities);
  - ☐ Managing wastes in a beneficial manner to prevent land, water & air contamination;
  - ☐ Reporting on the status & trends of environmental conditions through the ROE

- Accomplishments & Projected Activities
  - ☐ Research on Contaminated Sites
    - Innovative technologies for site characterization & remediation
    - Contaminated groundwater & sediments – a critical issue at 85% of sites
    - Technical Support Centers - Responding to over 300 requests/yr
  - ☐ Lead Exposure Modeling to Protect Children's Health
  - ☐ Aid State & Local decision-making on the role of ecosystem services & public health outcomes
  - ☐ Continue to Update the Report on the Environment (ROE)

28

EPA

- The **Safe & Sustainable Water Resources (SSWR)** research program focuses on the Administrator's priorities of
  - Developing reliable and cost-effective solutions for current, emerging and long-term water infrastructures and resources challenges;
  - Informing policy making and assistance to states.

- Accomplishments & Projected Activities
  - Developing methods to detect Per and Polyfluoroalkyl Substances (PFAS) in drinking water
    - develop and validate methods for 24 PFAS in ground, surface, drinking and waste waters; as well as for soil, sediment and biosolids.
  - Developing satellite imagery for the early detection of harmful algal blooms
    - evaluate and implement monitoring and mitigation strategies to provide states with methods to predict and prevent harmful algal blooms.
  - Developing methods and models for monitoring pathogens at beaches
    - develop methods for same-day notifications of pathogens in recreational waters to better inform beach closure decisions, which could save $5-50M per year in public health care expenses.

EPA
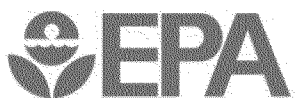
- The **Chemical Safety for Sustainability (CSS)** research program focuses on the Administrator's priorities of
  - ☐ Understanding methods, data, information, and tools to help make more informed, timely decisions about chemicals, many of which have not been thoroughly evaluated for potential risks to human or ecological health.
  - ☐ Strengthening the Agency's ability to evaluate and predict impacts from the use and disposal of manufactured chemicals.

- Accomplishments & Projected Activities:
  - ☐ Providing direct support for implementation of alternative toxicity testing, chemical prioritization and chemical evaluation activities required by TSCA (ongoing – also supports FIFRA, SDWA).
  - ☐ Developed analytical framework to support decisions on engineered nanomaterials throughout their life cycle (ongoing, supports TSCA, FIFRA; follow-on activities contingent on funding).
  - ☐ Deploying new digital tools to provide comprehensive chemical information to decision-makers (Chemical dashboard, ECOTOX Knowledge base, SeqAPASS, CPDAT) (ongoing).
  - ☐ Expanding breadth and depth of information on chemical toxicity and exposure using high throughout methodologies in support of agency implementation of TSCA, FIFRA, FQPA, SDWA (ongoing)

☼EPA

- The **Homeland Security Research Program** focuses on the Administrator's priorities of:
  - ☐ Supporting EPA's efforts to help communities prepare for, absorb, and recover from disasters;
  - ☐ Remediating contaminated environments affected by incidents.

- Accomplishments & Projected Activities
  - ☐ Developed wide-area cleanup approaches
    - Completed a multi-agency cleanup demonstration of a biothreat agent-contaminated subways system.
  - ☐ Improved water system restoration
    - Completed water infrastructure cleanup studies vital to the water sector
  - ☐ Built capabilities to characterize large disasters.
    - Developed composite sampling approaches to support faster characterization of wide areas
  - ☐ Developing characterization and decontamination approaches for select chemicals;
  - ☐ Assessing the efficacy of portable treatment technologies through field-scale evaluations;
  - ☐ Assessing and improve scalable decontamination technologies.

EPA

- The **Human Health Risk Assessment (HHRA)** research program focuses on the Administrator's priorities of
  - ☐ Sustaining EPA's commitment to developing agile, fit-for-purpose portfolio of robust and responsive scientific assessment products that characterize risks and potential impacts to human health and the environment;
  - ☐ Applying scientific assessments to inform EPA actions on safety of chemicals; cleaning up, revitalizing and returning land back to communities; providing clean and safe water; and improving air quality;
  - ☐ Applying rapid risk assessment tools to respond to emerging, often crisis-level environmental contamination issues.

- Accomplishments & Projected Activities
  - ☐ Released final IRIS assessments for Benzo[a]pyrene and Ethylene Oxide
  - ☐ Released Draft ISA for Sulfur Oxides- Health Criteria to support NAAQS
  - ☐ Continue to develop IRIS and PPRTV assessments to inform EPA's decisions at contaminated Superfund, Brownfields, and hazardous waste sites.
  - ☐ Continue to provide research and technical support to deliver safe drinking water, with focus on known and emerging chemical and biological contaminants.